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CLAIMS

What is claimed is:

1. A zero-valent metal emulsion comprising:

- a) a plurality of zero-valent metal particles;
- b) a surfactant;
- c) an oil; and
- d) water.

2. The zero-valent metal emulsion of claim 1, wherein said plurality of zero-valent metal

particles is a plurality of zero-valent iron particles.

3. The zero-valent metal emulsion of claim 2, comprising

- a) 6.4-10.6 wt.% zero-valent iron particles;
- b) 1.0-1.8 wt.% surfactant;
- c) 32-53 wt.% oil; and
- d) 36-59 wt% water.

4. The zero-valent metal emulsion of claim 3, comprising:

- a) 8.5 wt.% zero-valent iron particles;
- b) 1.4 wt.% surfactant;
- c) 42.7 wt.% oil; and
- d) 47.4 wt. % water.

5. The zero-valent metal emulsion of claim 2, wherein said plurality of zero-valent iron particles is a plurality of nanoscale zero-valent iron particles or a plurality of microscale zero-valent iron particles.

5 6. The zero-valent metal emulsion of claim 5, wherein said plurality of nanoscale zero-valent iron particles are 100-300 nm in diameter.

7. The zero-valent metal emulsion of claim 5, wherein said plurality of microscale zero-valent iron particles are 1-3 microns in diameter.

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8. The zero-valent metal emulsion of claim 1, wherein said surfactant is selected from the group consisting of sodium sulfocinate, sorbitan sesquioleate, sorbitan monooleate, sorbitan trioleate, sodium dodecylbenzene sulfonate, sodium naphthalene sulfonate, sodium lauryl sulfate, sorbitan monostearate, polyoxyethylene-sorbitan monostearate, polyoxyethylene-sorbitan

15 tristearate, polyoxyethylene-sorbitan monooleate and polyoxyethylene-sorbitan trioleate.

9. The zero-valent metal emulsion of claim 1, wherein said surfactant is a food-grade surfactant.

20 10. The zero-valent metal emulsion of claim 1, wherein said oil is a food-grade vegetable
oil.

11. The zero-valent metal emulsion of claim 10, wherein said food-grade vegetable oil is corn oil.

12. A method for remediating a halogenated solvent comprising:

5 a) providing a zero-valent emulsion comprising a plurality of zero-valent metal particles, a surfactant, an oil and water; and

 b) adding said zero-valent metal emulsion to said halogenated solvent, whereby said halogenated solvent is dehalogenated.

10 13. The method of claim 12, wherein said halogenated solvent is trichloroethene.

14. The method of claim 12, wherein said halogeneated solvent is in-situ and said zero-valent metal emulsion is added to said halogenated solvent using a system of injection wells or push rods.

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15. The method of claim 12, wherein said halogeneated solvent is in-situ and said zero-valent metal emulsion is added to the halogenated solvent by way of slurry injection into a soil matrix.

20 16. The method of claim 12, wherein said halogenated solvent is located in groundwater.

17. The method of claim 12, wherein said plurality of zero-valent metal particles is a plurality of zero-valent iron particles.

18. The method of claim 17, comprising

- a) 6.4-10.6 wt.% zero-valent iron particles;
- b) 1.0-1.8 wt.% surfactant;
- c) 32-53 wt.% oil; and
- d) 36-59 wt% water.

19. The method of claim 18, comprising:

- a) 8.5 wt.% zero-valent iron particles;
- b) 1.4 wt.% surfactant;
- c) 42.7 wt.% oil; and
- d) 47.4 wt. % water.

20. The method of claim 17, wherein said plurality of zero-valent iron particles is a plurality of nanoscale zero-valent iron particles or a plurality microscale zero-valent iron particles.

21. The method of claim 20, wherein said plurality of nanoscale zero-valent iron particles are 100-300 nm in diameter.

22. The method of claim 20, wherein said plurality of microscale zero-valent iron particles are 1-3 microns in diameter.

23. The method of claim 12, wherein said surfactant is selected from the group consisting of sodium sulfocinate, sorbitan sesquioleate, sorbitan monooleate, sorbitan trioleate, sodium dodecylbenzene sulfonate, sodium naphthalene sulfonate, sodium lauryl sulfate, sorbitan monostearate, polyoxyethylene-sorbitan monostearate, polyoxyethylene-sorbitan tristearate, polyoxyethylene-sorbitan monooleate and polyoxyethylene-sorbitan trioleate.

24. The method of claim 12, wherein said surfactant is a food-grade surfactant.

25. The method of claim 12, wherein said oil is a food-grade vegetable oil.

26. The method of claim 25, wherein said food-grade vegetable oil is corn oil.